Center Innovation Fund: ARC CIF

Self-Healing Electronics for Deep Space Missions

Completed Technology Project (2017 - 2018)

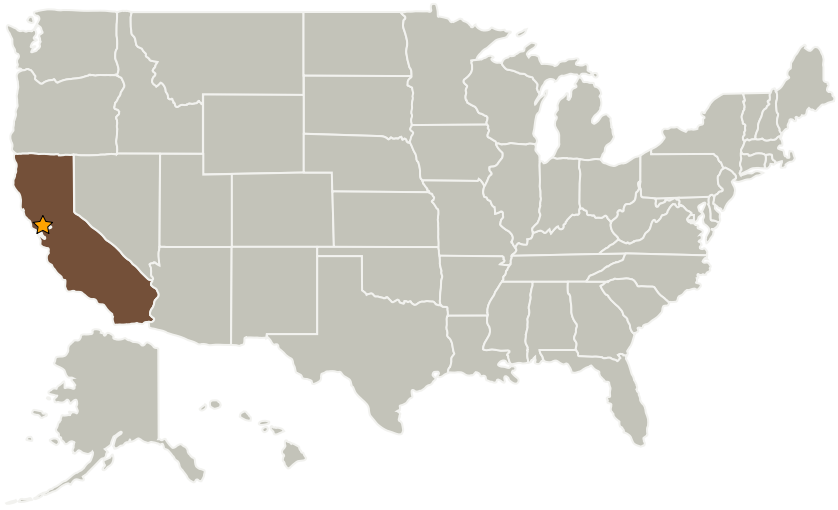
Project Introduction

We will integrate a microheater as an on-chip in-situ annealing functional block into the unused backside of the COTS chip. The radiation degradation will be monitored, and the microheater will be triggered, as needed, to anneal out the defects. Next steps include submitting a NIAC and GCDP proposal.

Anticipated Benefits

Our technology will benefit all space missions since electronics plays pivotal role in the operation, control, execution of the science missions, payload etc.

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Ames Research Center(ARC)	Lead Organization	NASA Center	Moffett Field, California
Naval Postgraduate School	Supporting Organization	Academia	Monterey, California
Stanford University(Stanford)	Supporting Organization	Academia	Stanford, California

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Primary U.S. Work Locations
California

Project Transitions

October 2017: Project Start

September 2018: Closed out

Closeout Summary: Final TRL:5. We have demonstarted a paradigm-changing concept of self-healing electronics wherein damage due to radiation is annealed on-the-fly and the device functionality is restored as before. A microheater fabri cated on the unused backside of the COTS chip anneals the defects as needed w hen device malfunction is detected. This will allow the use of non-space grade C OTS electronics in the future, allowing state-of-the-art electronics for space miss ions at lower cost and weight (without shielding) while reducing mission failures.

Project Website:

https://www.nasa.gov/directorates/spacetech/innovation_fund/index.html#.VC

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Ames Research Center (ARC)

Responsible Program:

Center Innovation Fund: ARC CIF

Project Management

Program Director:

Michael R Lapointe

Program Manager:

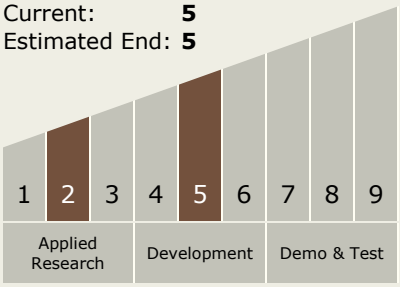
Harry Partridge

Principal Investigator:

Meyya Meyyappan

Technology Maturity (TRL)

Start: **2**
Current: **5**
Estimated End: **5**



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Technology Areas

Primary:

- TX07 Exploration Destination Systems
  - TX07.3 Mission Operations and Safety
    - TX07.3.4 Integrated Risk Assessment Tools

Target Destinations

Mars, Others Inside the Solar System